A UHF HIGH POWER TRANSCEIVER SYSTEM WITH WIRELESS INTERFACE MODULES FOR HIGH ALTITUDE DATA ACQUISITION AND CONTROL

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ABSTRACT

High altitude balloons present a challenge for control and data acquisition systems. In the past, the University of Idaho Vandal Atmospheric Science Team has used onboard automated systems, but these systems lack the ability to interact the ground teams. Such interactive situations include trajectory miscalculations requiring immediate cut-down of the payload, real-time science experiment control, and the real-time gathering of flight data. Most affordable systems using commercial protocols do not provide the necessary output power for a stable link over the required distances. Real-time trajectory tracking using APRS transmitters, such as the Byonics Microtrak, is a limited and impractical way of relaying non-trajectory related dated and does not allow for a data uplink.

The system presented, code-named "Project Ginger," is designed to overcome these limitations and provide affordable future expansion of the Near Space Engineering program. Ginger comprises two UHF full-duplex high power transceivers with low power 2.4GHz wireless network nodes for the data acquisition and control. The high power transceivers are split onto two boards, with one board aboard the payload and the other board with the ground team. These 10 Watt, 500 kbps boards provide enough power to link 30 km apart. Ginger can also be used in pico-satellites therefore the system is designed with cubesat dimensions in mind.

The 2.4 GHz subsystems, code-named "Allspice," are designed to link the main Ginger board to separate nodes in adjacent capsules. This approach eliminates the need for inter-capsule wiring and establishes a communications standard onboard the balloon.

Ginger has already been successfully used on two balloon launches: Fall 2008 and Spring 2009. An allspice node is planning to be used in an upcoming Spring 2010 launch for the payload cut-down system. Success in the upcoming launch will provide valuable information for future balloon missions and further near-space research.